Will knowledge and attitudes towards chronic fatigue syndrome (CFS) improve when using a game-based approach?

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Abstract

Chronic fatigue syndrome is a medical condition that has various symptoms one of which being severe fatigue as one of the main symptoms. This project aimed to educate users about this condition through gamification and discover whether this type of methodology of teaching can be used to assist in education. To help with educating users, someone with CFS was used to implement both their experience and knowledge about this condition into the prototype. XX participants (YY female, age) played the game, and their knowledge and empathy levels were measured before and after the gameplay. Whilst the information regarding CFS was at a basic level the participants showed their understanding improved when comparing the before and after results. Additionally, the prototype showed that participants felt more empathy towards those who have CFS. Future research is required to understand more about the effects of game-based interventions on chronic diseases.

Introduction

What is CFS?

Mylagic encephalomyelitis which is also known as chronic fatigue syndrome (CFS) is a complex medical condition that has a range of symptoms, but the most prominent symptom is severe fatigue (Wearden & Appleby, 1996). Chronic fatigue syndrome is a big topic with medical professionals as this condition has made it exceedingly difficult to pinpoint its true cause. Additionally, CFS having multiple symptoms that match other conditions means that diagnosing this condition is more of a challenge.
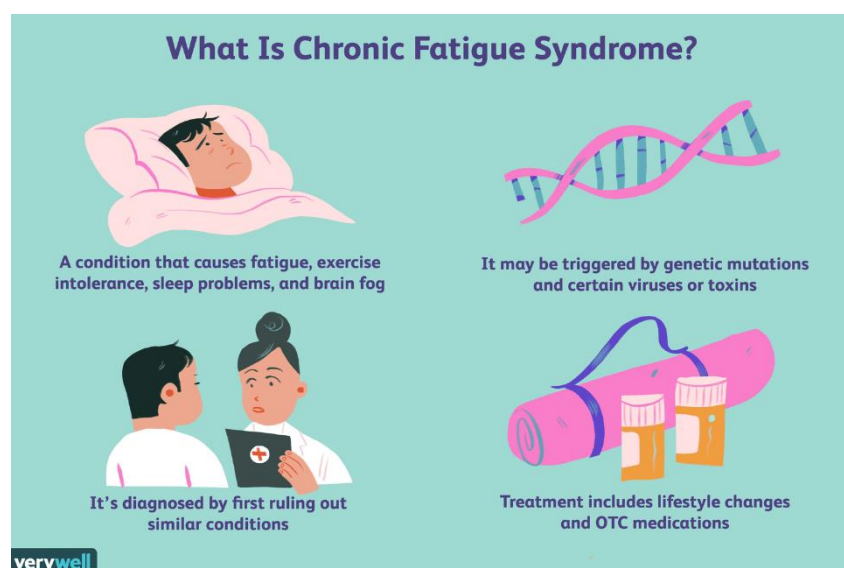
Physical and psychological effects

Whilst CFS is not a condition as well-known as others, most people do not understand the effects this condition has on a person and typically dismiss the condition as just making people tired.

CFS can affect people in multiple ways and can even be a playing factor that causes anxiety, panic attacks and depression in people but by utilizing a new way of providing teaching through games there could be a potential way to help. Vugts et al (2023) completed a test to see whether serious games have any effect on rehabilitation for patients with chronic pain or fatigue. During their test, they discovered from their results that whilst there was little change in the patients there was still one outcome that provided a change in depressive mood. This shows that whilst there was not a large effect that would be groundbreaking there is still enough evidence to show that with some adjustment's games could be used for rehabilitation. This is important as another potential aspect to investigate would be another section of the prototype that could be used to help provide rehabilitation for people with CFS.

Often when people with CFS experience extreme fatigue their vision can become quite blurry followed by pain throughout the body. Additionally, CFS can cause cognitive impairment which can lead to many things, confusion, forgetfulness and problems sleeping [4]. The information provides further insight into the effects of CFS and how it does much more than affect people physically but also psychologically which can lead to further complications. Moreover, these additional symptoms and effects can be implemented into the project to capture the effects of CFS and display them to the player to provide more immersion through this experience. When implemented into the project, the effects can be used to foster empathy from the participants and understand how they perceive people with CFS dealing with their everyday lives.

Treatment & Management

However, with these challenges come effective treatments that can aid people with CFS to manage this condition. CFS can vary in its intensity and depending on how it affects the person more intensive care may be needed.

An article by Vyas, J (2022) provides results from a test about the impact of CFS on the quality of life of people with CFS and their families. The results showed that the highest emotion was worry and this was families being quite worried about how ME/CFS would affect the person in their family. The results showed that a large majority of families would consistently feel frustrated and sad with their family member who has CFS. Additionally, a large majority (83%) showed that family members found it increasingly difficult to take care of their family members with CFS. These results provide evidence that CFS is not just a condition that affects the individuals themselves but also the people around them meaning that this is a heavy burden for all the family to carry. Furthermore, it has shown that there must be more support systems in place to assist with how people with CFS can manage their condition to fit with their daily routines.

Video Games in Education

Utilizing games in education can help educate others in certain areas of studies since games in general are created to have some sort of engagement and stimulation from the players. Jayakanthan (2002) mentions that games can provide the players with various pleasures such as challenges, rewards, mental engagement, and even multi-sensory stimulation. This article provides evidence to prove that games could have potential use in education due to having several ways for players to learn as they are engaged and that using them can help simplify learning for students.

<u>Project Goals</u>

Considering that research regarding this topic is scarce, I decided to try to research multiple aspects that would be helpful when preparing for this project. Galeote et al (2023) conducted a test to discover whether text-based or game-based communication would affect people's attitudes towards climate change. Through their testing, they discovered that VR was more entertaining for people and when they tested playing on a PC before, the last result showed that text-based was the least enjoyable. This information is incredibly useful as it proves that people would enjoy something educational much more if they were allowed to interact with it through a game, but this also means that there must be a new creative way to incorporate educational content such as notes about CFS throughout the game. In addition to this, the article provides a new perspective when deciding on an innovative approach for this project which could potentially provide users with a VR version which would allow them to fully immersive themselves and understand how someone with CFS deals with their daily life.

The purpose of this project is to help educate more people about CFS and how it affects people with it. The project demo will allow users to experience the daily life of someone with CFS and understand what they go through and how they manage daily activities with their condition. Research will be conducted to understand the best ways to depict someone with CFS and how best to educate others through the demonstration.

Methods

The important aspect of this research will be conducted through an interview with Joseph Butcher, who is someone that has CFS and has been through a lot when dealing with this condition. The information he can supply regarding CFS will be quite useful to shape the project prototype in a way to help educate others on this condition.

The prototype was created in Unreal Engine 5 and allowed players to experience the daily life of someone with CFS. Throughout the demo, players were able to experience symptoms of CFS that can occur depending on the levels of their energy. These symptoms would affect the player's abilities in-game for example when the players reach a low energy level their vision will become blurry, and their overall walking speed will be much slower. In addition to this, the player will be confused at low energy levels and will be unable to remember what other tasks they must complete in the day.

It is important to note that all these effects and changes to the player are not based solely on research about people with CFS but also involve experiences that Joseph has gone through himself. Due to this a lot of the project's focus will be on how Joseph handles his everyday life and how one choice could impact his entire day.

There has been an idea to reshape the prototype and create 3 different life stories of people with CFS to show how they might have different symptoms and a daily life then someone else with the condition. Additionally, there has been another idea which would involve developing multiple short story demos and each story would allow the player to experience a daily life but with different conditions such as CFS, anxiety, depression and more. This idea is certainly an idea of interest but would require much deeper research to ensure that the demo expresses these experiences correctly.

The aim of this prototype is to primarily answer the main question of whether people's knowledge towards CFS changes when they are exposed to a demo that shows them what people with CFS really go through every day. Whilst the main question is important another question that should be looked at would be whether the results from this prototype can prove that this methodology can be used in other practices to help educate others about other subjects which would pave the way for a new effective way of teaching.

Prototype/Participants/Stats

The prototype testing should last for a short while as during this time players should experience all the aspects of the game such as what happens when they burn out nearly all their energy or what happens when their happiness levels are consistently low. During the players game time there can be times when they perform an action or fall below a certain energy level a new information note will pop up and either describe what they player is experiencing in that moment or give new information about CFS.

The information notes will provide the player with more information about CFS and additionally, if they wished to know more about that current topic, they would be presented with a button that would bring up a new pop-up which plays an audio video describing more about the topic.

The participants of the testing will be ages 19+ and will be presented with a quiz before and after the testing to track if players have learned from this prototype, if they feel any different about people with CFS and if this method can be used to provide effective teaching.

The results from this quiz will all be noted inside of an Excel spreadsheet allowing for the data to be made into graphs to provide more visual clarity when it comes to presenting data. Additionally, all participants will also be given an opportunity to describe what they thought about the project and the results from that will help provide more evidence for whether this method can be used for teaching.

Finally, all the participants will be required to sign a consent form which states that they understand the purpose of this testing and that whilst their names or any personal information will not be revealed, the data they provide from the testing will be used in this project. The consent form will also state that all the data and information will be safely stored in a secure OneDrive folder which can only be accessed by those that are authorized.

Results

A total of 10 users were tested and results found that before they played the prototype the two questions that were missed the most were the simpler ones. A large majority of the group couldn't answer what CFS is and how it is diagnosed (See Figure 1).

Figure 1: Displaying the two most missed questions.

The average score was 6 out of 11 meaning that some people did have an idea about CFS, but there was still room for improvement the hope was that this prototype would be able to assist with helping users understand more about CFS and see if they could empathize with people with CFS (See Appendix 1a).

The results after the users tested the prototype showed that many user's test scores improved and on average were higher than previously. Additionally, a survey was conducted to see study whether user's attitudes toward CFS had been affected (See Appendix 1b).

The results of this survey showed that there was a majority mix of people who were happy and neutral with their understanding of CFS. There was a leading majority who were neutral in their understanding of what people with CFS go through in their daily lives. However, there were still a few participants who were interested in learning more about the condition.

The last two questions were empathy questions and the results showed that a majority of participants were upset about what people with CFS must live with and the limitations that come with the condition in their daily lives. The final question was whether there was any sympathy towards people with CFS and what their limitations are in their daily lives.

Discussion of Results

The early test scores showed that users had a limited understanding of CFS, especially questions asking what CFS is and how it was diagnosed. The test scores after the user testing showed that every participant improved their scores meaning that the prototype was effective in teaching new information.

The results from the empathy survey provided results that showed that participants had a mix of feelings with their understanding of CFS and when looking further at the results we can see that there was a large majority of participants were neutral about what people with CFS go through every day. From these results, we can clearly see that whilst there were some improvements to their knowledge about CFS through the prototype perhaps the current information about CFS was too basic which meant that the information was quite limited to the users.

The success of the prototype may have been held back due to its limited information but the area it did succeed in was drawing in users and engaging them enough for them to want more information. There was a large majority of participants that wanted to learn more about the condition which further supports the fact that the information was basic, and that advanced information could now be added to the prototype.

Finally, the results from the empathy questions show that the prototype information and the effects that cause the player to feel confused, have blurry vision and become slower were enough to have

the participants feel sympathy towards people with CFS. It should be noted that whilst the majority agreed towards feeling sympathy there was another group of participants that were neutral about this feeling. This could be since the game had players sit at a computer and play through daily life when it really should have been changed to have been a Virtual Reality (VR) game from the start. The game being in VR would have allowed the users to truly feel the effects of CFS and would further help with empathizing towards people with this condition.

Previously in an article by Jayakanthan (2002) it was discovered that games can be utilized to teach others about certain topics whether it be through challenges or rewards meaning that if it can engage the users, it could be effective in teaching. The results from the prototype testing showed that users did learn from the prototype and wanted to learn more about the condition. These results can be compared to the results of the article which help to provide further support regarding what was found in the article. Both the results make it clear that using games in teaching can be effective learning even if the information is simple at the beginning, what is important is that the information becomes more and more advanced, but the method of teaching doesn't change.

The results from an article by Vugts et al (2023) showed that serious games could be used to assist with some form of therapy for patients. These results were used to help create the effects of CFS in the prototype to help draw sympathy from the participants. Whilst the aims of this project and the article were different, the goals of affecting the user's psyche were very similar Vugts et al (2023) wanted to help with rehabilitation and the results proved that there were some changes that helped the patients. This projects prototype had results that proved some people did have sympathy and this could be another reason as to why the participants wished to learn more about CFS.

This information helped discover that creating the project in Virtual reality (VR) could help further immerse users in the life of someone with CFS. The methods used in this project could become a foundation to be built upon for developing engaging educational games which would ideally involve offering a balance between fun entertainment which would help with engagement and teaching information to increase the learning.

Conclusions

The project aims were to help further educate users that initially had no knowledge of CFS but also to help discover if this type of gamification is effective in teaching users about other topics. The results showed that whilst there were areas of the prototype that helped with teaching CFS and making players feel sympathy, the prototype still may have lacked in areas which prevented users from being able to really immerse themselves in the shoes of someone with CFS. The participants found it difficult to understand what people with CFS go through in their daily lives and this led to the understanding that the prototype could have benefited from being in VR.

The project still achieved most of the aims set for it and with additional time there would be more of an expansion to the demo incorporating more effects that can be caused by neglecting the happiness or hunger of the in-game character and adding more advanced knowledge about CFS. Incorporating mental health in the prototype could help with showing the users how one condition could lead to further damages to mental health.

Practical applications

Whilst this was a short prototype, this methodology used in this project could be used to create more educational games that both keep the users engaged with the content and teach new

information about topics which would make teaching more fun and keeps the users coming back for more.
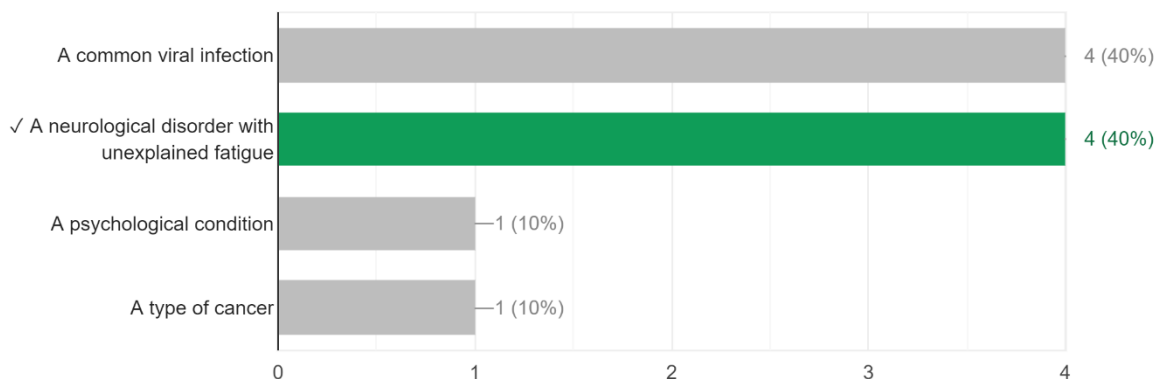
References

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[2] Jayakanthan, R., 2002. Application of computer games in the field of education. *The electronic library*, *20*(2), pp.98-102.

[3] Vugts, M.A., Joosen, M.C., Mert, A., Zedlitz, A.M. and Vrijhoef, H.J., 2018. Effectiveness of serious gaming during the multidisciplinary rehabilitation of patients with complex chronic pain or fatigue: Natural quasi-experiment. *Journal of medical Internet research*, *20*(8), p.e250.

[4] Vyas, J., Muirhead, N., Singh, R., Ephgrave, R. and Finlay, A.Y., 2022. Impact of myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) on the quality of life of people with ME/CFS and their partners and family members: an online cross-sectional survey. *BMJ open*, *12*(5), p.e058128.

[5] Wearden, A.J. and Appleby, L., 1996. Research on cognitive complaints and cognitive functioning in patients with chronic fatigue syndrome (CFS): What conclusions can we draw? *Journal of psychosomatic research*, *41*(3), pp.197-211.

Appendices

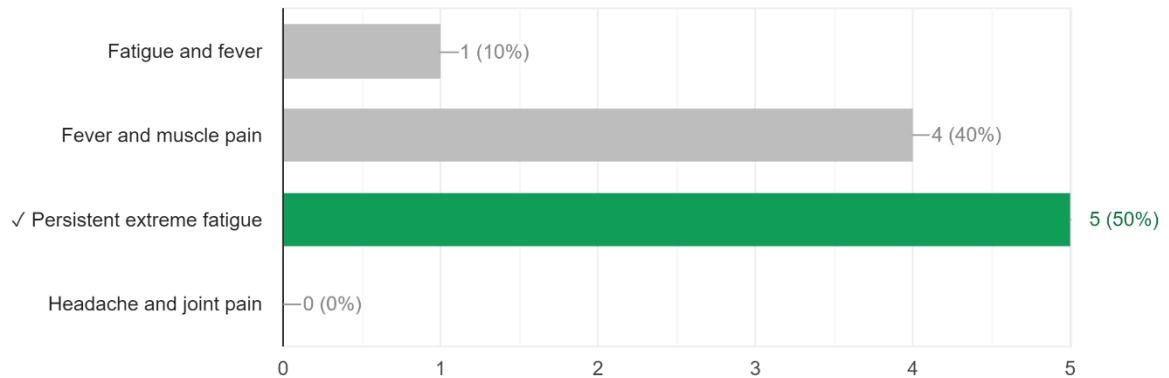### Appendix 1a: Results from CFS Test

What is CFS, also known as Myalgic Encephalomyelitis (ME)?
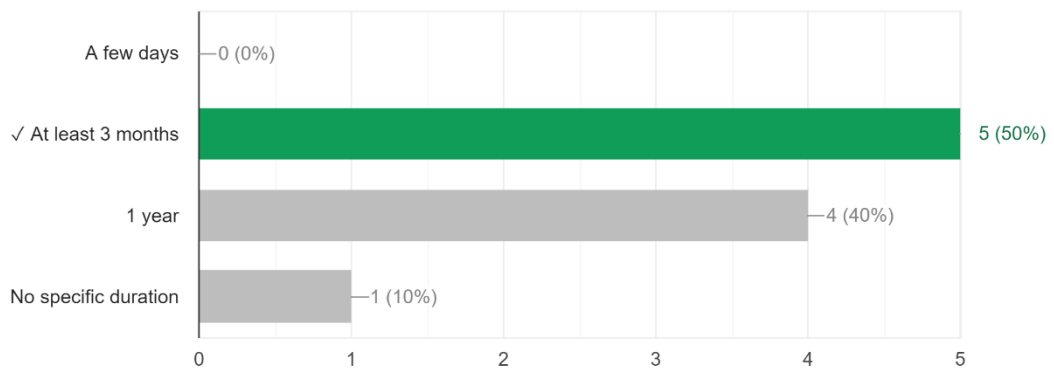4 / 10 correct responses

What is the main symptoms of CFS?
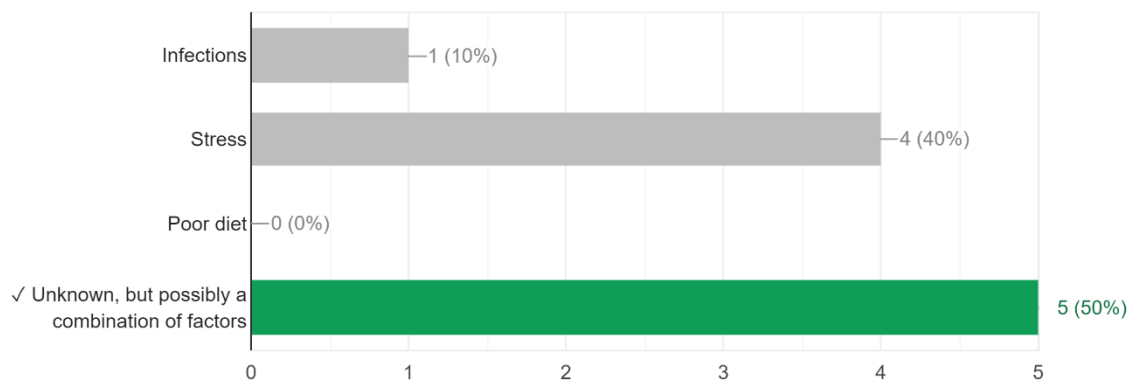
5 / 10 correct responses

Answer	Count
Fatigue and fever	1 (10%)
Fever and muscle pain	4 (40%)
✓ Persistent extreme fatigue	5 (50%)
Headache and joint pain	0 (0%)

How long must fatigue last for a diagnosis of CFS?

5 / 10 correct responses

Answer	Count
A few days	0 (0%)
✓ At least 3 months	5 (50%)
1 year	4 (40%)
No specific duration	1 (10%)

What is the primary cause of CFS

5 / 10 correct responses

Answer	Count
Infections	1 (10%)
Stress	4 (40%)
Poor diet	0 (0%)
✓ Unknown, but possibly a combination of factors	5 (50%)

How is CFS diagnosed?

2 / 10 correct responses

Through a blood test	3 (30%)
Based on a physical examination	3 (30%)
✓ By ruling out other potential causes of fatigue	2 (20%)
Through a brain scan	2 (20%)
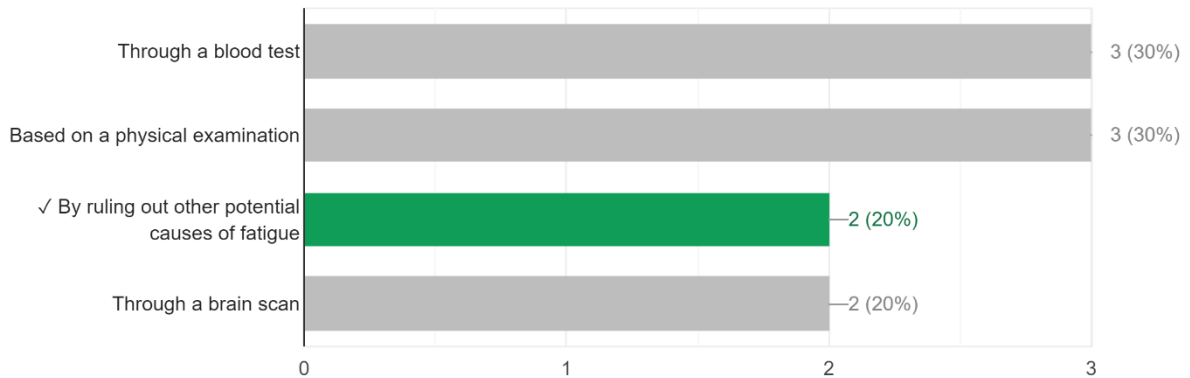
Is there a cure for CFS?

7 / 10 correct responses

Yes, through antibiotics	1 (10%)
✓ No, but it can be managed with treatment	7 (70%)
Yes, with a healthy lifestyle	1 (10%)
No, and it can't be managed	1 (10%)
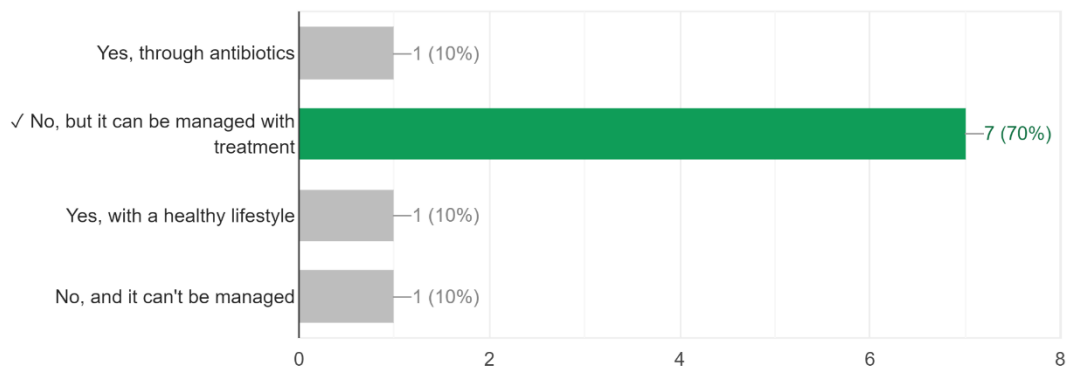
How does CFS affect a person's daily life?

8 / 10 correct responses

It has no impact on daily life	0 (0%)
✓ It may cause significant limitations in daily activities	8 (80%)
It only affects physical activities	2 (20%)
It only affects mental activities	0 (0%)
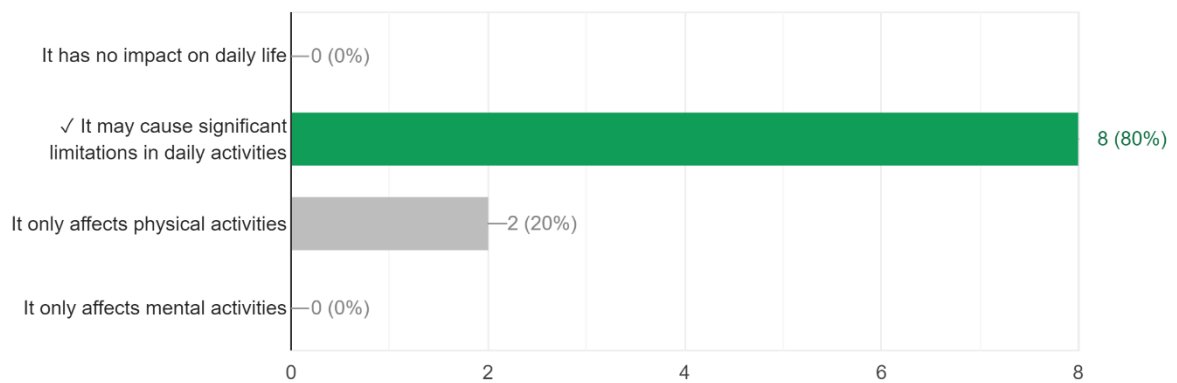
What are some common treatments for CFS?

7 / 10 correct responses

Antibiotics	2 (20%)
✓ Exercise therapy and cognitive-behavioral therapy	7 (70%)
Surgery	1 (10%)
Herbal remedies	0 (0%)
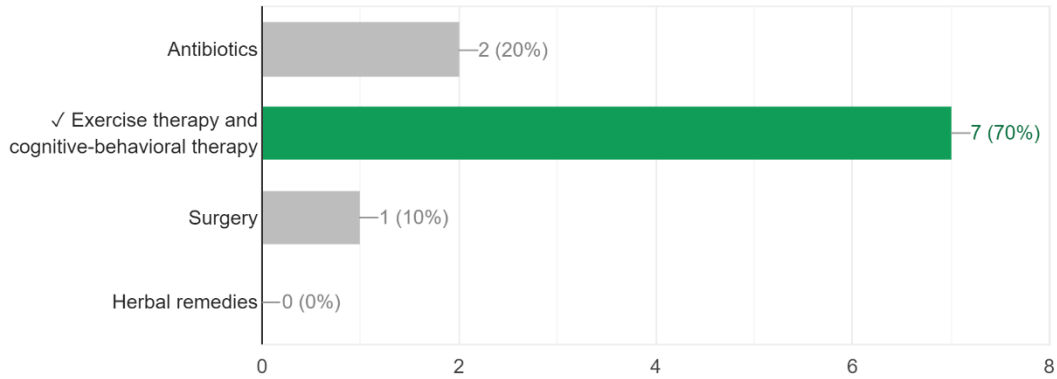
Are medications typically used to treat CFS?

6 / 10 correct responses

✓ Yes, for symptom relief	6 (60%)
No, medications are not effective for CFS	2 (20%)
Only for children with CFS	0 (0%)
Only in the advanced stages of CFS	2 (20%)
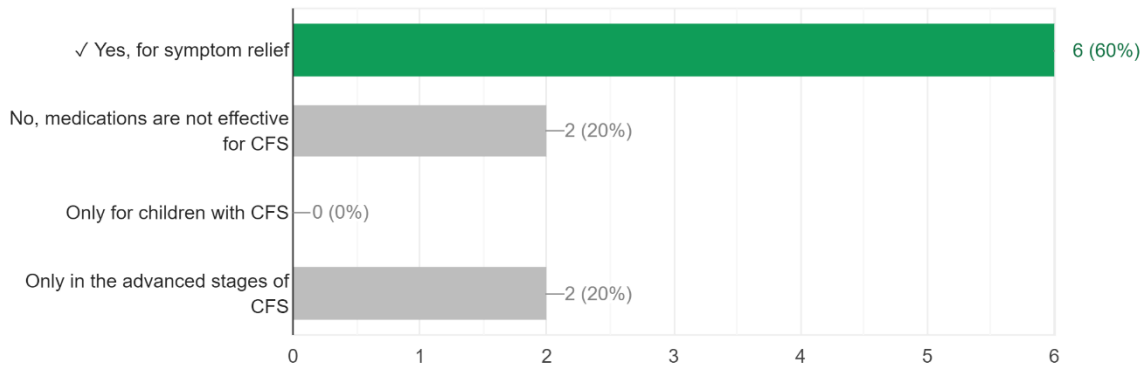
Are there any advocacy organizations dedicated to CFS awareness and support?

7 / 10 correct responses

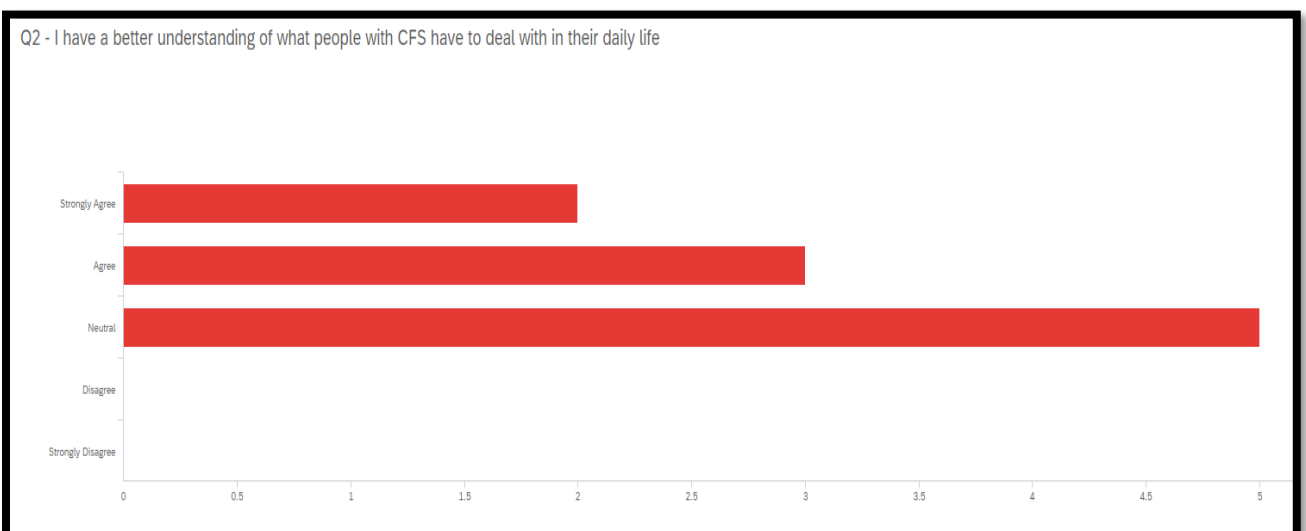|	
No, there are no such organizations	1 (10%)
Only in Europe	2 (20%)
✓ Yes, several organizations like MEAction and Solve ME/CFS Initiative exist	7 (70%)
Only for children with CFS	0 (0%)
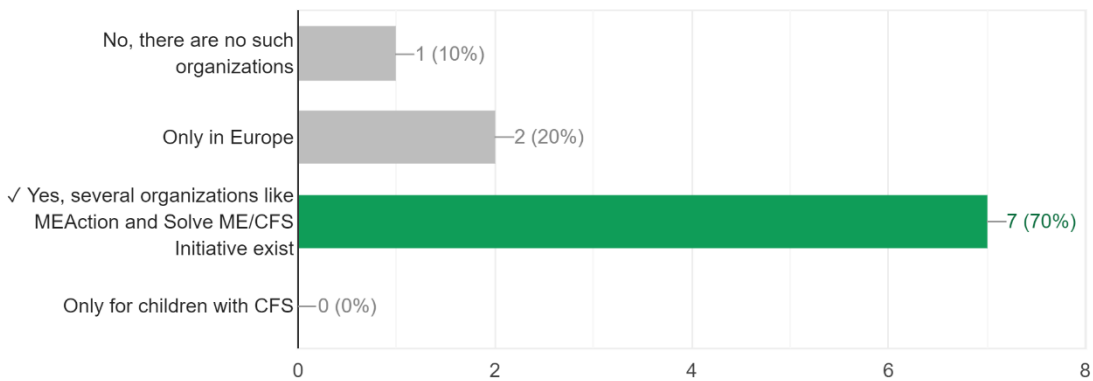
What is the general prognosis for CFS?

6 / 10 correct responses

Full recovery is common	2 (20%)
CFS always leads to disability	1 (10%)
✓ It varies from person to person, with some improving and others living with chronic symptoms	6 (60%)
It only affects the elderly, so prognosis is not relevant	1 (10%)
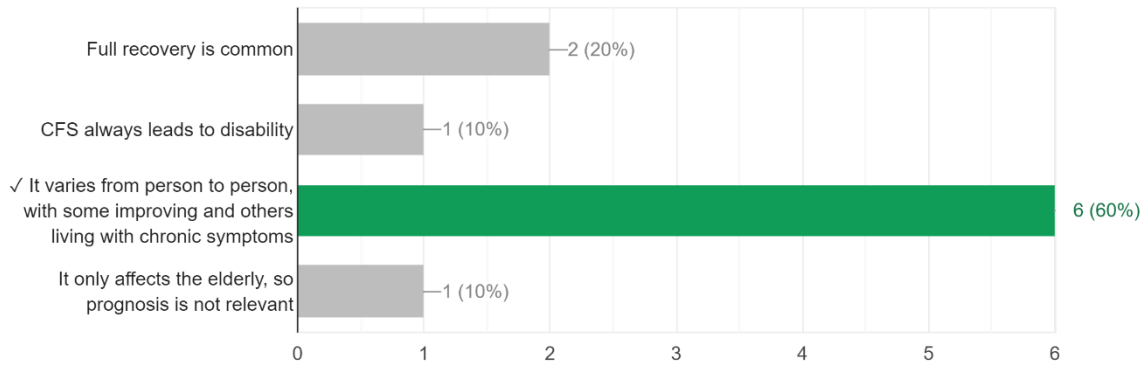
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Appendix 1b: Results from empathy survey

Q1 - I have a better grasp on what ME/CFS is now

Q2 - I have a better understanding of what people with CFS have to deal with in their daily life
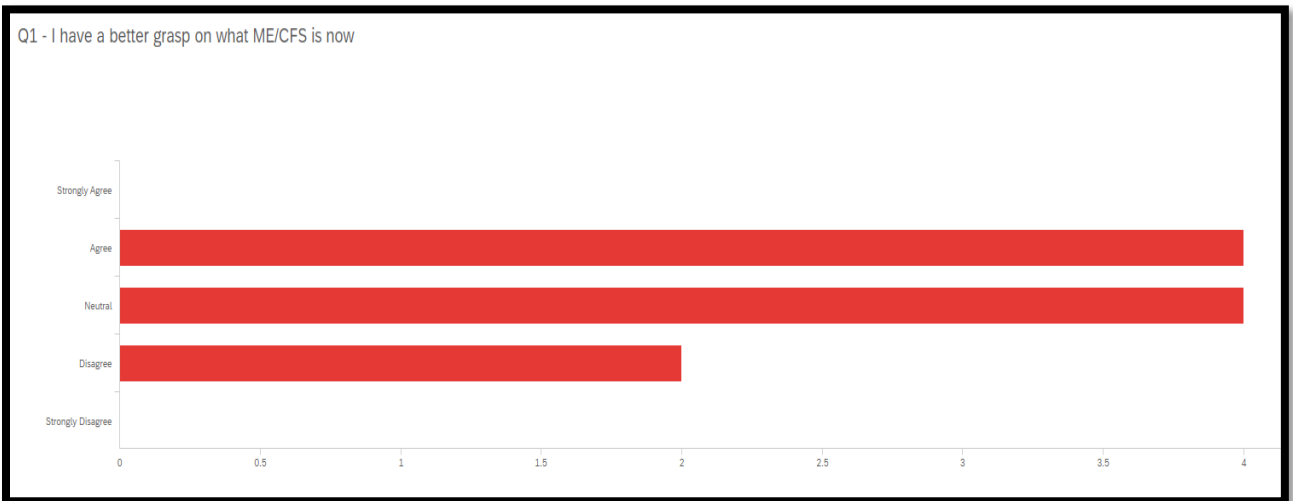
Q3 - I'm interested in learning more about ME/CFS

Strongly Agree	
Agree	6
Neutral	4
Disagree	
Strongly Disagree	
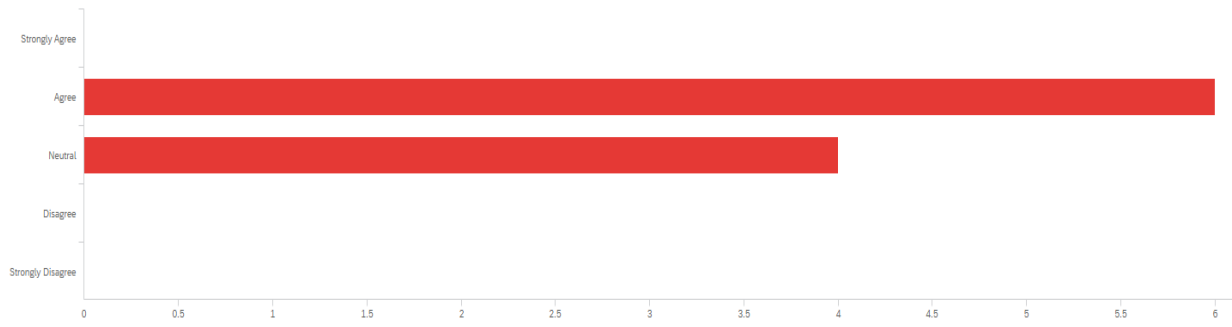
Q4 - It upsets me seeing what people with CFS have to go through

Strongly Agree	2
Agree	6
Neutral	2
Disagree	
Strongly Disagree	
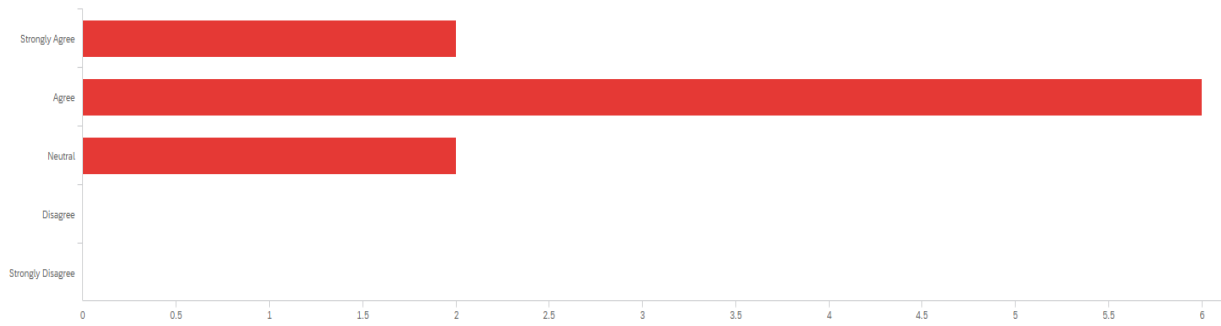
Q5 - I feel sympathy for people with CFS when their condition limits them at times

Strongly Agree	
Agree	6
Neutral	4
Disagree	
Strongly Disagree	